Market Development Opportunities for Foundry Sands & Slags

US EPA Briefing

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FIRST

Market Development Issues

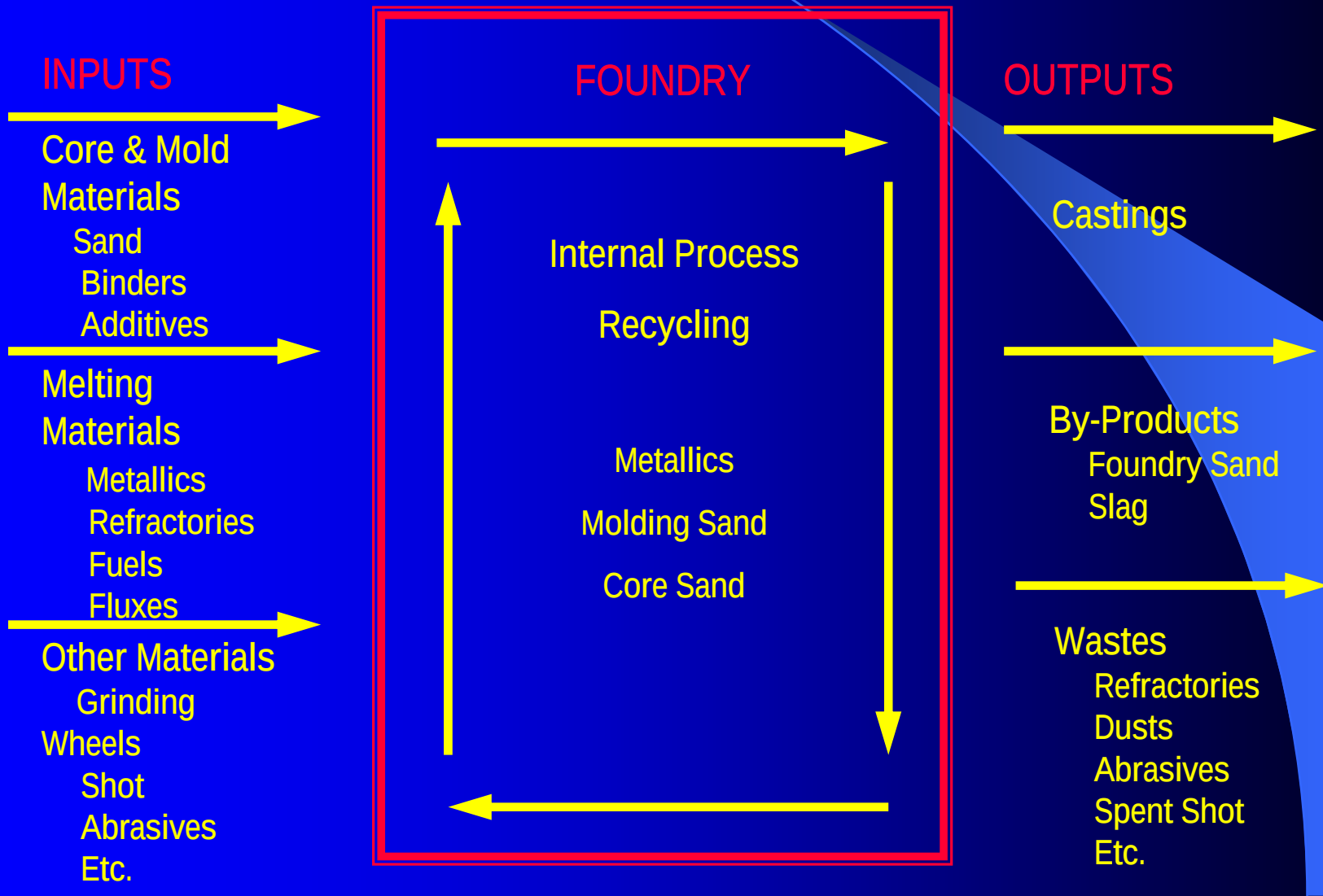
- Establish Fine Foundry Aggregate (FFA) as a product in targeted markets
  - Sustainable economies require materials usage strategies
  - Mineral resources are finite
- Develop reliable, quality-controlled supplies
- Overcome barriers to market entry: 4 E's

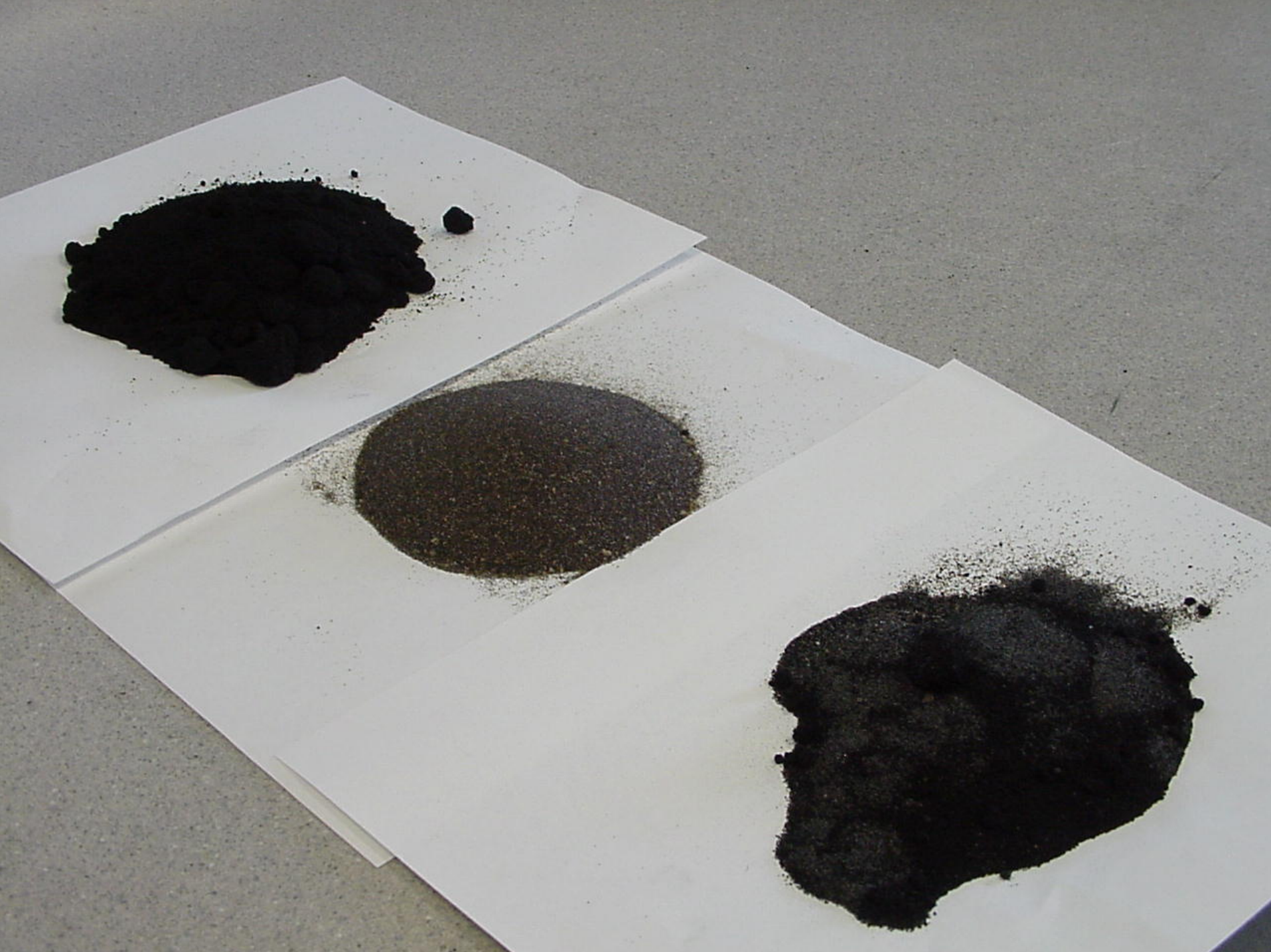
Environmental	Education
Engineering	Economic

Foundry Sand is an Engineered Material

- Uniformly sized, high grade silica sands are critical raw materials for metalcasting
- Quality control of sands in casting process is continuous
- Sand is internally recycled 8-100 times
- FFA: high grade sands no longer usable inside foundry
- 6-10 million ton annual generation
  - Additional large stockpiles, some in monofills

Foundry Process





What happens to used sand?

- Reduce
- REUSE
- Recycle
- Dispose

- **About 100 million tons of sand are used annually in the U.S. casting process**
- **More than 90 % is reclaimed and reused multiple times in the foundry**
- **An estimated 10 % of sands cannot be reused internally and must be removed from the foundry process**

What happens to used sand?

- Reduce
- Reuse
- Recycle
- DISPOSE
  - ADC
  - Caps & closures
  - Cell construction

What can be done with sand?

- Reduce
- Reuse
- RECYCLE!
- Dispose

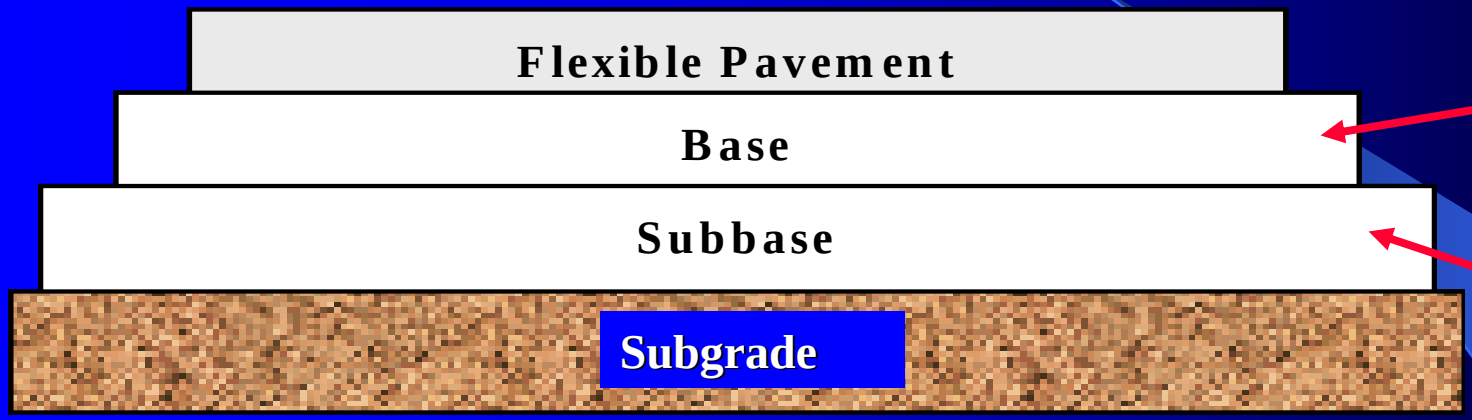
- **Foundry sand is an EPA RCC Priority Material**
- **Foundry sand is an FHWA Priority Material**
- **Foundry sand, aka “Fine Foundry Aggregate,” has many PROVEN applications in the construction markets**

Proven Applications

- Manufactured products
  - Cement
  - Concrete & related products
    - Brick, block, mortars
  - Asphalt
  - Flowable fill/CLSM
  - Misc., inc. ceramics & rock wool
- Geotechnical applications
  - Base courses
  - Structural fills
  - Embankments
  - Landfill construction
- Soil amendments
  - Manufactured topsoils
  - Nursery & grower soils

Foundry Sand in Structural Fills and Embankments

Foundry Sand in Road Bases



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Cheap

Flexible pavement structure

Rigid pavement structure

FFA in Sub Base or Embankment

- Not Susceptible to Freeze/Thaw
- Excellent compaction values
- Easy to use, handling not an issue
- Extremely uniform material, in contrast to conventional granular materials
- Relatively abundant and low cost
- Not moisture sensitive

Foundry Sand in Hot Mix Asphalt

- Gradation
- Particle Cleanliness
- Soundness
- Absorption & Stripping

Flowable Fill (CLSM)

Foundry Sand in Flowable Fills

Component	Typical Mix Design (lb/yd^3)	Range (lb/yd^3)
Fine Aggregate / Foundry Sand	2850	1850-2910
Cement	100	50-200
Fly Ash	250	0-300
Water	500	325-580

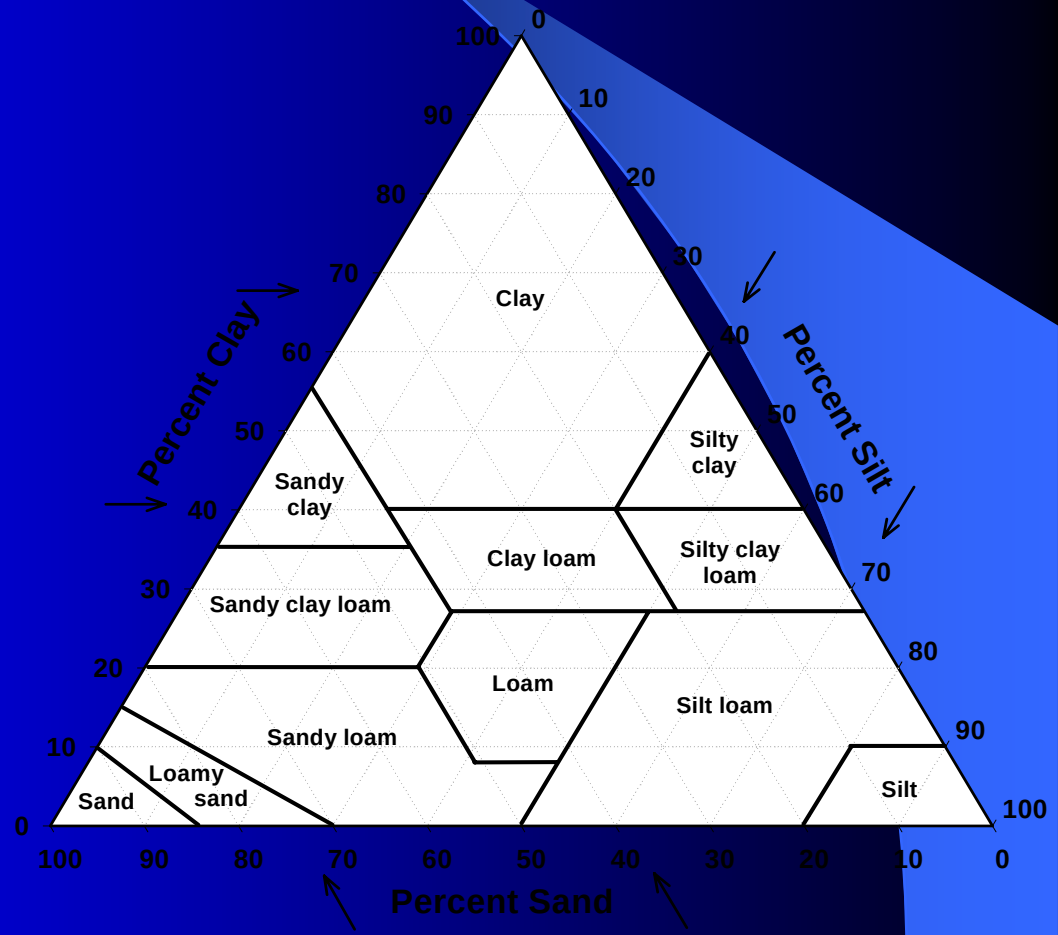
Precast Concrete Products

Iron Foundry Slags

- Similar in chemistry & uses to blast furnace slags
  - Air Cooled
  - Granulated
- Road bases
- Bituminous aggregates
- Road abrasives

Other Applications

- Where is the clay an advantage?
  - Hydraulic barriers
    - Landfill construction
    - Caps & closures
    - Alternate daily cover
  - Soil Manufacturing



Role of FFA in Soil Manufacture

- Ideal for soil manufacture due to uniformity, consistency and process control
- Sand is an essential ingredient of soil
- Topsoil specifications require a high sand content
- FFA is uniform, dark and low in contaminants

Some Specific Needs & Opportunities

- **Ag & Horticultural <u>Needs 50 M tons/yr</u>:**
  - **Potting Soil**
  - **Turf Production and Management**
  - **Landscaping**
  - **Soil Renovation and Remediation**
- **<u>Opportunities: 500 M tons/yr</u>**
  - **Co-Utilization of By-products**
  - **Tailor-made soils for specialty uses**

USDA Foundry Sand Initiative

- 5 year research program
- Assessing environmental characteristics of multiple foundry sands
- Peer-reviewed research
  - 9 journal articles to date
  - University collaborators
- Region 5 has coordinated inputs from regulators
- Draft guidelines for use in soils to be circulated in 2007

Barriers to Expanded Use

- Wide variability among state programs
- Limited self-implementing state programs
- Smaller foundries cannot afford extensive testing
- Some end uses require large volumes, therefore blending from multiple sources is needed
- Stigma associated with classification as “waste” can be hard to overcome
- EPA endorsement to states and end users would be valuable

www.foundryrecycling.org

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